28. A method of semi-solid molding a high strength metal part within a die cavity defined by a die set mounted on a vertical die cast press, the press including a shot sleeve having a generally vertical axis and enclosing a shot piston movable axially within the sleeve with the sleeve and piston defining a shot chamber above the piston, the method comprising the steps of:

melting a solid metal to form a molten metal,

treating the molten metal with a grain refiner,

transferring the molten metal into the shot chamber,

cooling the molten metal within the shot chamber to within a predetermined temperature range while the molten metal within the shot chamber has a horizontal width substantially greater than its vertical depth and without stirring the molten metal to form a substantially quiescent and shallow semi-solid slurry having a globular and generally non-dendritic microstructure,

moving the shot piston upwardly within the shot chamber to inject a central portion of the semi-solid slurry from the shot chamber into the die cavity through a gate opening within a central portion of the shot chamber, and

allowing the semi-solid slurry to solidify within the die cavity to form the metal part.

29. A method as defined in claim 28 wherein the molten metal is cooled within the shot chamber into the semi-solid slurry while the molten metal has a horizontal width at least twice the vertical depth of the molten metal.

30. A method as defined in claim 28 including the steps of:

forming a downwardly facing annular entrapment recess above the shot chamber and generally in axial alignment with an inner surface of the shot sleeve, and

trapping a more solidified outer portion of the semi-solid slurry adjacent the shot sleeve within the entrapment recess in response to upward movement of the shot piston.

31. A method as defined in claim 28 wherein the molten metal is cooled within the shot chamber to a temperature range which produces a range of 40% to 60% solid to form the semi-solid slurry.

32. A method as defined in claim 28 wherein the molten metal is A356 aluminum alloy and is cooled within the shot chamber to a temperature within the range of 570°C to 590°C to form the semi-solid slurry.

33. A method as defined in claim 28 and including the steps of:

directing the molten metal into a second shot chamber receiving a second shot piston,

interchanging the second shot chamber and piston with the first shot chamber and piston after the central portion of the semi-solid slurry is injected from the first shot chamber into the die cavity, and

cooling the molten metal within the second shot chamber to within the temperature range while the molten metal within the second shot chamber has a

horizontal width substantially greater than its vertical depth and without stirring the molten metal to form a second charge of the semi-solid slurry.

34. A method of semi-solid molding a high strength metal part within a die cavity defined by a die set mounted on a vertical die cast press, the press including a shot sleeve having a generally vertical axis and enclosing a shot piston movable axially within the sleeve with the sleeve and piston defining a shot chamber above the piston, the method comprising the steps of:

melting a solid metal to form a molten metal,

treating the molten metal with a grain refiner,

transferring the molten metal into the shot chamber,

cooling the molten metal within the shot chamber to within a predetermined temperature range while the molten metal within the shot chamber has a horizontal width substantially greater than its vertical depth and without stirring the molten metal to form a substantially quiescent and shallow semi-solid slurry having a globular and generally non-dendritic microstructure with a range of 40% to 60% solid,

forming a downwardly facing annular entrapment recess above the shot chamber and generally in axial alignment with an inner surface of the shot sleeve,

moving the shot piston upwardly within the shot chamber to inject a central portion of the semi-solid slurry from the shot chamber into the die cavity through a gate opening within a central portion of the shot chamber,

trapping a more solidified outer portion of the semi-solid slurry adjacent the shot sleeve within the entrapment recess in response to the upward movement of the shot piston, and

allowing the semi-solid slurry to solidify within the die cavity to form the metal part.

35. A method as defined in claim 34 wherein the molten metal is cooled within the shot chamber into the semi-solid slurry while the molten metal has a horizontal width at least twice the vertical depth of the molten metal.

36. A method as defined in claim 34 and including the steps of:

directing the molten metal into a second shot chamber receiving a second shot piston,

interchanging the second shot chamber and piston with the first shot chamber and piston after the central portion of the semi-solid slurry is injected from the first shot chamber into the die cavity, and

cooling the molten metal within the second shot chamber to within the temperature range while the molten metal within the second shot chamber has a horizontal width substantially greater than its vertical depth and without stirring the molten metal to form a second charge of the semi-solid slurry.